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Process for the Continuous Recovery of Free Tartaric Acid from Raw Materials Containing Potassium Hydrogentartrate

Description

This invention relates to a process for the continuous recovery of free tartaric acid ($H_6C_4O_6$) from raw materials containing at least 5.0 wt-% potassium hydrogentartrate ($KH_5C_4O_6$) in dry matter, in particular from byproducts obtained during wine preparation, such as tartar, wine yeast or the like, in that the raw materials are mixed with water and potassium hydrogentartrate is dissolved.

The most part of the tartaric acid used in the industry is produced from byproducts containing potassium hydrogentartrate, which are obtained during wine preparation, such as tartar, wine yeast, marc, distillation residues, calcium tartrate, etc.. In the better known processes, potassium hydrogentartrate is obtained by precipitation; the raw materials to be processed either are attacked with an acid and potassium hydrogentartrate is precipitated from the solution obtained by means of a basic agent or the raw materials are treated with a basic agent and the potassium hydrogentartrate is precipitated by adding an acid.

In the process described in DE-C-264005, the raw materials to be processed are roasted and treated with basic and acid agents such that a solution of a neutral tartrate and a solution of free tartaric acid is obtained. By mixing the two solutions, the tartaric acid is precipitated as potassium hydrogentartrate.

From FR-A-2646421 there is known a process for producing tartaric acid, in which the bitartrates contained in the raw materials are neutralized to obtain soluble tartrates. The aqueous solution of the tartrates is subjected to an electrodialysis, in which the ion exchange is effected on semipermeable membranes, for the purpose of producing a tartaric acid solution. The construction and operation of such an electrodialysis plant require quite a considerable effort. In addition, the tartrate solutions subjected to the ion exchange must be free of organic substances, as the same would otherwise be decomposed during electrodialysis by forming ammonia.

The DE-A-19819884 is concerned with a process of producing tartaric acid from raw materials whose dry matter consists of at least 5.0 wt-% potassium hydrogentartrate, in which first of all potassium hydrogentartrate is converted to dipotassium tartrate ($K_2H_4C_4O_6$) by stirring with aqueous potassium hydroxide solution, the aqueous solution formed is stirred at a pH-value of 2 to 5 upon removal of impurities by filtration in a precipitation stage with added acid, preferably tartaric acid recirculated from the process, from the formed suspension containing potassium hydrogentartrate crystals the potassium hydrogentartrate crystals are separated, washed with water, an aqueous solution saturated with potassium hydrogentartrate for at least 80 wt-% is produced, potassium is removed from this solution, and from the aqueous tartaric acid solution formed water is at least partly removed. During the conversion of potassium hydrogentartrate by means of aqueous potassium hydroxide solution to obtain dipotassium tartrate, the organic compounds contained therein, such as phenolates, sugar polymers, slimy substances and other cell ingredients, are disadvantageously dissolved, which greatly impede filtration.

It is the object of the present invention to design the above-described process for the recovery of free tartaric acid from raw materials containing at least 5.0 wt-% potassium hydrogentartrate in dry matter, in particular from byproducts obtained during wine preparation, such as tartar, wine yeast or the like, such that the filter cake obtained during the filtration of the aqueous solution from the impurities to be separated does not impede the formation of the filtrate.

This object is solved in that a suspension (solid-liquid mixture) consisting of solids and potassium hydrogentartrate dissolved in water is decanted, the clarified liquid

obtained thereby is supplied to a microfiltration for separating microfine solid particles, the filtrated formed thereby is cooled to crystallization temperature under a vacuum for the purpose of crystallizing the potassium hydrogentartrate, the potassium hydrogentartrate crystals formed are centrifuged for the purpose of spinning off liquid and are subsequently dissolved in water, from the aqueous potassium hydrogentartrate solution the potassium is removed by ion exchange, and the tartaric acid solution obtained is evaporated by forming tartaric acid crystals. By separating potassium hydrogentartrate from the raw materials by means of water, the organic impurities contained in the raw materials are largely not dissolved and form a filter cake both during decanting and during the microfiltration of the clarified liquid obtained during decanting, which filter cake does not impair the separation of the filtrate. Due to the cooling crystallization of the filtrate performed under a vacuum, the addition of acid, in particular the recirculation of process tartaric acid, can be omitted. It is thus advantageously possible to design both the plant for the cation exchange and the plant for the evaporation of the tartaric acid solution 50% smaller than the corresponding plants which are required for performing the process in accordance with DE-A-19819884.

The invention is explained in detail and by way of example with reference to the basic flow diagram shown in the drawing.

To a heatable stirred tank (1) wine yeast as raw material containing potassium hydrogentartrate is charged via conduit (2) and water is charged via conduit (3) and mixed intensively. The suspension (solid-liquid mixture) formed thereby is discharged from the stirred tank (1) via conduit (4) and supplied to a decanter (5), by means of which the solids chiefly consisting of wine yeast are separated from the liquid. The solids discharged from the decanter (5) via conduit (6) are cleaned in another decanter (7) serving as washing means, to which water is supplied via conduit (8), are withdrawn via conduit (9) and supplied to a further use, e.g. as fodder yeast. The washing water obtained is recirculated to conduit (3) via conduit (10). The clarified liquid freely flowing out of the decanter (5) via conduit (11) is supplied to a ceramic microfilter means (12), in order to separate solid particles possibly still present in the clarified liquid, which are recirculated to the stirred tank (1) via conduit (13). The filtrate containing dissolved potassium hydrogentartrate is supplied via conduit (14) to a crystallizer (15) consisting of one or more stages, in which potassium hydrogentartrate is crystallized by cooling the filtrate to a

temperature of 5°C under a vacuum of 0.007 bar. If necessary, there is a possibility for arranging a non-illustrated activated carbon filter between the ceramic microfilter means (12) and the crystallizer (15) for decolorizing the filtrate. The liquid formed during the cooling crystallization is partly recirculated to the stirred tank (1) via conduit (16), whereas the remaining amount is discharged from the process via conduit (17). The potassium hydrogentartrate crystals discharged from the crystallizer (15) via conduit (18) are supplied to a centrifuge (19), in which the liquid still adhering to the potassium hydrogentartrate crystals is spun off. The liquid obtained thereby is recirculated to the crystallizer (15) via conduit (20). The potassium hydrogentartrate crystals leaving the centrifuge (19) via conduit (21) are charged to a heatable stirred tank (22), in which the potassium hydrogentartrate crystals are dissolved at temperatures of 75-95°C by adding water flowing in via conduit (23). From the stirred tank (22), the solution largely saturated with potassium hydrogentartrate is withdrawn via conduit (24), then passed over an activated carbon bed (25) for decoloration and thereafter supplied via conduit (26) to a cation exchanger (27) for removing the K⁺ ions. A part of the solution containing 10 to 20% tartaric acid is recirculated from the cation exchanger (27) to the stirred tank (22) via conduit (28), whereas the residual part of the tartaric acid solution enters an evaporator (30) via conduit (29) and is evaporated therein by forming tartaric acid crystals. The tartaric acid crystals formed are discharged from the process via conduit (31).

An advantageous aspect of this basic flow diagram consists in that tartar supplied via conduit (33) and water flowing in via conduit (34) are mixed in a heatable stirred tank (32), the mixture is charged to a ceramic microfilter means (36) via conduit (35), and the filtrate formed is fed via conduit (37) into conduit (14) leading to the crystallizer (15).

Wine yeast having a content of 8.5 wt-% potassium hydrogentartrate in dry matter, which was obtained during wine preparation, is intensively mixed in the stirred tank (1) with 3.0 kg water per kg wine yeast at a temperature of about 80°C for a maximum of 60 min, in order to completely separate the potassium hydrogentartrate from the wine yeast. Subsequently, the aqueous solution having a temperature of about 80°C is separated by means of a decanter (5) into a sediment consisting of solid organic particles of 30 wt-% in dry matter and a clarified liquid containing 2.8 wt-% potassium hydrogentartrate. After the passage

of this liquid through a ceramic filter (12), potassium hydrogentartrate is crystallized out of this filtrate in a crystallizer (15) at a temperature of about 5°C and a vacuum of 0.007 bar. The potassium hydrogentartrate crystals largely liberated from liquid by means of a centrifuge (19) are dissolved in a stirred tank (22) by adding water, and the solution is charged to a cation exchanger (27) in which 15% tartaric acid is produced, which is subsequently evaporated in an evaporator (30) by forming tartaric acid crystals.